IN THE SPECIFICATION:

Please amend paragraph **[0026]** as follows:

[0026] One exemplary embodiment of a rocket motor according to the present invention, which may comprise an upper or final stage rocket motor, is depicted in FIG. 1. The motor case assembly comprises a motor case housing 12 which houses the pressure vessel 14 (also sometimes termed a "motor case") having a plurality of valves in communication therewith. Within the pressure vessel 14, low density foam 20 surrounds and insulates the solid propellant grain 22. In one exemplary, nonlimiting implementation of the present invention, the motor case assembly within motor case housing 12 may have a diameter 16 of between about 25 and 30 inches, currently preferred to be 27.6 inches and a length 18 of between 30 and 35 inches, currently preferred to be 32 inches. Solid propellant grain 22 may comprise, for example, a free standing class 7 HMX ~~(cyclotretramethylenetetranitramine) oxidized~~ (cyclotetramethylenetetramine)-oxidized composite propellant with a binder system based on hydroxyl-terminated polybutadiene (HTPB) polymer and cured with ~~isophorene~~ isophorone diisocyanate (IPDI) curative including a small amount of carbon black as an opacifier, the propellant being formulated to burn stably over a wide pressure range. Alternatively, solid propellant grain 22 may comprise, for example, an aluminum powder-fueled, hydroxyl-terminated polybutadiene (HTPB) polymer-based binder. One currently preferred propellant is a nonaluminized HTPB propellant grain of 228 lbm for the above-sized rocket motor. The solid propellant chosen for use may be any of those known to one of ordinary skill in the art, as the present invention does not require a specific propellant for implementation.

Please amend paragraph **[0030]** as follows:

[0030] Changes in internal temperature will affect the pressure within the pressure vessel 14. Temperature as well as pressure sensors may be added to the pressure ~~vessel~~ vessel 14 to monitor these parameters, and the axial thrust valve flow area may be modulated to compensate for such temperature effects to achieve a substantially constant axial thrust, if desired. Flow through one or more maneuver control valves 28, 30, 36a, 36b, 38a and 38b may also be modulated to affect pressure within the pressure ~~vessel~~ vessel 14 to compensate for

temperature effects, or to achieve desired thrust levels. The addition of pressure sensors (transducers) to the pressure ~~vessel~~ vessel 14 to monitor chamber pressure thereof is desirable since factors other than temperature such as, for example, manufacturing variations will affect system performance. The use of pressure transducers enables modulation of the flow through the valves communicating with the pressure ~~vessel~~ vessel 14 to compensate for any factors ~~which~~ that affect chamber pressure. Feedback from the pressure transducers may also be used in a closed loop control system to control desired parameters of the propulsion system. Accelerometers may also be added to the rocket motor to provide a more accurate measurement by which thrust may be predicted or system performance monitored. Feedback from the accelerometers may also be used in a closed loop control system to control desired parameters of the propulsion system.

Please amend paragraph **[0032]** as follows:

[0032] The maneuver control thrusters for pitch, yaw and roll may, instead of being aimed transversely to the longitudinal axis L of the rocket motor, be oriented to release gases substantially in the direction of axial thrust (not shown). Thus, ~~pitch~~ pitch, yaw and roll control thrusters may be individually offset from the longitudinal axis L of the rocket motor; however, these maneuver control thrusters may, for example, be located and oriented to collectively form a concentric ring about the longitudinal axis L of the rocket assembly, so that simultaneous operation of certain or all of the associated maneuvering valves causes the maneuver control thrusters to provide thrust to the vehicle without adjustment in pitch, yaw or roll. In such a configuration, and if the maneuver control thrusters may provide sufficient axial thrust, the presence of a separate, main axial thrust valve to provide axial thrust is optional.

Please amend paragraph **[0034]** as follows:

[0034] Roll control may be achieved by the mode of operation illustrated in FIG. 5. Opening two maneuver control valves, such as valves 36a and 36b to respectively power opposing, off-axis maneuver control thrusters 40a and 40b, produces offset thrust about longitudinal axis L in a common plane transverse to longitudinal axis L in directions 62 and 64,

causing the vehicle to roll in a clockwise direction 66. With the addition of propellant mass above that which is required for axial thrust, maneuvering functions can thus be performed without affecting axial thrust levels. The maneuver control thrusters 32, 34 may be smaller than the axial thruster 26 (see FIG. 1), with each maneuver control thruster 32, 34 for pitch control and each maneuver control thruster of the two sets of yaw and roll maneuver control thrusters 40a, 40b and 42a, 42b providing a smaller force than the axial thruster 26. For example, and not by way of limitation, maneuver control thrusters 32 and 34 for pitch control may be designed to each provide 1,000 lbf maximum thrust capability, while maneuver control thrusters 40a, 40b, 42a and 42b for yaw and roll control may each be designed to provide a 500 lbf maximum thrust capability.

Please amend paragraph **[0035]** as follows:

[0035] FIGS. 6 through 8 illustrate an exemplary configuration of maneuver control valves 74, 76, 78, and 80 and associated maneuver control thrusters T in another exemplary embodiment of the invention. In this embodiment, maneuver control thrusters T may each comprise, for example, a thruster designed to provide 1,500 lbf of thrust. As shown in FIG. 6, opening maneuver control valves 74 and 78 in one mode of operation produces thrust in directions 84 and 88 for adjusting pitch of the vehicle. In FIG. 7, maneuver control valves 74 and 76 are opened in another mode of operation for producing thrust in directions 84 and 86 for controlling yaw of the vehicle. FIG. 8 depicts roll control accomplished through opening maneuver control valves 74 and 80 in yet another mode of operation, producing thrust in directions 84 and 90 for causing the vehicle to roll in counterclockwise direction 82.

Please amend paragraph **[0036]** as follows:

[0036] FIGS. 9 through 11 illustrate yet another exemplary embodiment of the invention and the configuration of maneuver control valves 92a, 92b, 96a, 96b, 98a, 98b, 100a and 100b and associated maneuver control thrusters T thereof. In this embodiment, maneuver control thrusters T may each comprise, for example, a thruster designed to provide 500 lbf of thrust. FIG. 9 depicts one mode of operation for controlling pitch of the vehicle. The pair of

maneuver control valves 92a and 92b is opened to create a force in direction 94. FIG. 10 shows adjustment of yaw of the vehicle in another mode of operation by opening maneuver control valves 96a and 96b for creating thrust in direction 102. Roll control, pictured in FIG. 11, may be achieved by opening two, off-axis maneuver control valves 96a and 100b in yet another mode of operation to produce thrust in the opposing and parallel but laterally offset directions depicted by arrows 104 and 106, causing the vehicle to roll in a clockwise direction 108.

Please amend paragraph **[0039]** as follows:

[0039] FIG. 14 depicts, in schematic form, an exemplary configuration for a hybrid rocket engine. Details of the structure of and suitable propellants, oxidizers and ignition sources for use in, such a hybrid rocket engine are known to those of ordinary skill in the art, and may also be found, for example, in U.S. Patent 6,393,830, assigned to the assignee of the present invention and the disclosure of which patent is incorporated herein by reference. A hybrid rocket engine according to the present invention may comprise a pressure vessel 114 containing a suitable solid propellant grain 122. Pressure vessel 114 is in selective communication with an axial thruster 126 through axial thrust valve 110 and in selective communication with a plurality of maneuver control thrusters 130 for pitch, yaw and roll control through respectively associated maneuver control valves 128. Any suitable number of maneuver control valves 128 and associated maneuver control thrusters 130 may be employed as desired or required, depending on the maneuver control thruster layout chosen. Axial thrust valve 110 and maneuver control valves 128 may comprise proportional, or throttling type valves. An oxidizer source 200 is disposed in selective communication with pressure vessel 114 through control valve 202, which may comprise a proportional, or throttling type valve. An ignition fluid source 210 is also disposed in selective communication with pressure vessel 114 through control valve 212, which may also comprise a proportional, or throttling type valve. Combustion of solid propellant grain 122 may be initiated by starting flow of oxidizer from oxidizer source 200 in combination with ignition fluid from ignition fluid source 210. Operation of the hybrid rocket engine for axial thrust and maneuver control may be conducted generally as described with respect to the solid rocket motor embodiments herein. However, termination of combustion of solid propellant

grain 122 may be terminated by terminating flow of oxidizer from oxidizer source 200 by closing control valve 202. Combustion of solid propellant grain 122 may be reinitiated by restarting flow of oxidizer from oxidizer source 200, as desired and, where combustion has been terminated for an extended period of time, by supplying ignition fluid from ignition fluid source 210. The present invention may also be implemented in the form of a so-called "reverse" hybrid rocket engine, as disclosed in the aforementioned patent, wherein a solid oxidizer grain may be employed in pressure vessel 114 and a flowable source of propellant selectively supplied thereto. Therefore, as used herein, the term "hybrid" rocket engines ~~include~~ includes both types.

Please amend paragraph **[0041]** as follows:

[0041] If desired, the solid propellant grain 22 may be extinguished at an appropriate time to preserve fuel for use at a later time. Fully opening all valves, comprising the axial thrust valve 10 in combination with all maneuver control valves such as 28, 30, 36a, 36b, 38a and 38b, will cause rapid depressurization of the pressure vessel 14. The resulting reduced pressure within pressure vessel 14 will extinguish the solid propellant grain 22. However, sufficient thermal mass, aided by the presence of low density foam 20, and continued ablation exists within the motor case or pressure vessel 14 to provide the necessary conditions for reignition at a later time. Closing all valves will increase the pressure within the ~~motor case~~ pressure vessel 14 and reignite the solid propellant grain 22. The ability to shut down and restart the rocket motor results in a theoretically infinite number of possible duty cycles which can be carried out on demand.

Please amend paragraph **[0042]** as follows:

[0042] Faster reignition of the solid propellant grain 22 may be accomplished through implementation of another exemplary embodiment illustrated in FIG. 12, through the addition of one or more igniter grains 54, 56 within pressure vessel 14. The igniter grains 54, 56 may be used selectively to provide a source of additional heat to increase the pressure within the ~~motor case~~ pressure vessel 14 and provide additional thermal energy to shorten the ignition time. Once the internal pressure has risen to an appropriate level, selected valves may be opened to desired positions to provide the desired thrust attitude and roll control for the vehicle. Of course, more or fewer than two igniter grains may be employed.